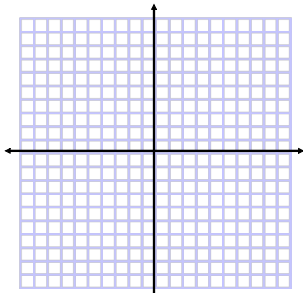


MPM 2D 2.1 Midpoint of a Line Segment

-how to determine the midpoint of a line segment with given endpoints
-how to find one of the endpoints given the midpoint and one endpoint

Investigation:

- Draw the line segments between the following sets of points on the grid.
 - A(2,8) and B(2,2)
 - C(2,2) and D(10,2)
- Determine the midpoint of each line segment.
 - M_{AB}
 - M_{CD}
- Draw the line segment between A(2,8) and D(8,2).
- Find the midpoint of line segment AD.



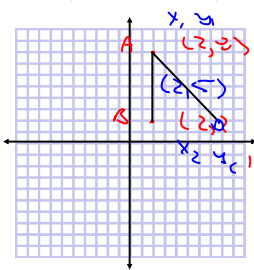
Sep 26-2:30 PM

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 $\frac{4}{2}, \frac{10}{2}$
 $(2, 5)$
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 $\frac{2+8}{2}, \frac{8+2}{2}$
 $(5, 5)$ Midpoint



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To calculate the coordinates of the midpoint of a line segment, AB, use the midpoint formula:

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example 1: What is the midpoint of A(-2, 3) and B(3, 1)?

Mar 5-7:51 AM

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x_1, y_1 x_2, y_2

$$\frac{-2 + 3}{2}, \frac{3 + 1}{2}$$


$$\frac{+1}{2}, \frac{4}{2}$$

$\therefore AB \text{ midpoint } \left(\frac{1}{2}, 2 \right)$

Mar 5-7:51 AM

Midpoint: the **coordinates** of the point that divides the line segment into two segments of equal length.


To calculate the **coordinates of the midpoint** of a line segment, AB, use the **midpoint formula**:

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$


Example 2: What is the midpoint of A(5, 7) and B(-2, 9)?

Mar 1-1:35 PM

Example 3: If $M_{AB} = (-3, -2)$ is the midpoint of line segment AB and A is (2, 6) what are the coordinates of B?



Mar 1-1:41 PM

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$$\begin{aligned}x_m &= \frac{x_1 + x_2}{2} & y_m &= \frac{y_1 + y_2}{2} \\-3 &= \frac{2 + x_2}{2} & -2 &= \frac{6 + y_2}{2} \\2(-3) &= 2 + x_2 & 2(-2) &= 6 + y_2 \\-6 &= 2 + x_2 & -4 &= 6 + y_2 \\-8 &= x_2 & -10 &= y_2 \\& & \mathbf{B(-8, -10)}\end{aligned}$$

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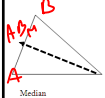
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2.1 Midpoint of a Line Segment

Recall: (refer to your textbook's glossary to define each term then fill in the diagram)

Median:

A line that is drawn from a vertex of a triangle to the midpoint of the opposite side.



Median

Midsegment:

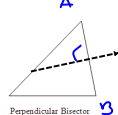
A line segment that connects the midpoints of two adjacent sides of a polygon.



Midsegment

Perpendicular Bisector:

A line that bisects a line segment and is perpendicular to the line segment.



Perpendicular Bisector

Recall: To determine an equation of a line (eg. median or perpendicular bisector) we need the slope and a point on the line)

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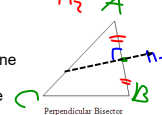
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Mar 5-7:49 AM

Homework

Pg. 69 # 3
Pg. 78 # 2, 4ace, 5, 6

$$\begin{aligned}A & (-5, 3) & B & (7, 7) \\x_1 & y_1 & x_2 & y_2 \\m &= \frac{y_2 - y_1}{x_2 - x_1} & y &= mx + b \\&= \frac{7 - 3}{7 - (-5)} & y &= \frac{1}{3}x + b \\&= \frac{4}{12} = \frac{1}{3} & 7 &= \frac{1}{3}(7) + b \\& & 7 &= \frac{7}{3} + b \\& & 7 - \frac{7}{3} &= b \\& & \frac{14}{3} &= b \\& & y &= \frac{1}{3}x + \frac{14}{3}\end{aligned}$$

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$$\therefore m = -\frac{4}{1}$$

passes through $(-1, -2)$

$$y = -4x + b$$

$$-2 = -4(-1) + b$$

$$-2 = +4 + b$$

$$-2-4 = b$$

$$-6 = b$$

$$\therefore y = -4x - 6$$

Feb 28-12:32 PM